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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/451,256	11/29/1999	STEVEN R. HOLLASCH	MSI-448US	8802

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EXAMINER	
AMINI, JAVID A	

ART UNIT	PAPER NUMBER
2672	3

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/451,256	HOLLASCH, STEVEN R.	
	Examiner	Art Unit	
	Javid A Amini	2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Claim1-56 rejected under 35 U.S.C. 102(b) as being anticipated by Migdal, patent US 6208347 B1.

1. As per claim 1, "defining a reference object relative to the represented object", Migdal discloses (Col. 42, Line 47-51) The process in step 717 places references to each altered point and the associated face and new faces are placed in the recalculation list (712). The recalculation list for this process is constructed as a stack for later processing. As for "determining the positions of the shapes relative to the reference objects using the characteristic data", Migdal discloses in (Col. 25, line 3-10), in addition, (Fig. 8) presents a loop which processes X, Y, Z values for each u position moving from the left to the right along the scan line. For each u increment, the processor creates X, Y, Z values and loads them into the 6D data point list 142 using the dXdu, dYdu and dZdu delta values (step 224). As for "determining, on the basis of the positions of the shapes relative to the reference object, those shapes that have no chance of intersecting the ray, and those remaining shapes that may intersect the ray", Migdal (Col. 7,Line 61-67), With the mesh modeling system and method of the present invention, any rendering engine that supports linear or bilinear interpolation, such as "Gouraud Shading" (available in many 3D and 21/2/2D graphic systems), will accept the mesh data points of the present invention and output a high-quality depiction or reproduction of the object or image. The rasterization

needed for generating the display can be done on the host processor (or for greater speed on special 3D hardware).

1. As per claim 2, "The method of claim 1 further comprising using a predetermined algorithm to determine which one of those remaining shapes intersects the ray", Migdal discloses (Col. 14, line 24-29) as each of the data points in the mesh carry color as well as spatial information, it is possible to generate an image of the object using only the mesh model. Algorithms for rendering, such as rasterization processes using Gouraud or Phong shading techniques, render mesh triangles in gradient color based on the color values contained in the 6D vertex coordinates of each face, so that a very life-like image of the object can be generated.

2. Claim 3 and 4, "The method of claim 1, wherein the collection of shapes comprises at least one or plurality of polygonal shape/s", Migdal discloses in (Col. 5, line 54-58; Fig. 10c), while such systems can optimize and change resolution, inter alia, they typically require large amounts of processing time to prepare the mesh or do not provide a reliable visual representation of the object when the mesh contains few polygons.

3. Claims 5 and 6, "wherein the collection of shapes comprises at least one or plurality triangle/s", Migdal discloses in (Fig. 10a-d), depicts a cloud of data points fitted to a sphere. Depicts a second cloud of data points fitted to a plane. Depicts a tetrahedron constructed for a cloud of data points where the initial reference object is a sphere. Depicts an initial mesh constructed from Steiner points where the initial reference object is a plane.

4. Claims 7, 8 and 9, "The method of claim 1, wherein the collection of shapes comprises a triangle mesh/strip/fan", Migdal discloses in (Fig. 2c-g) Depicts a mesh model of comparatively low resolution created according to the teachings of the present invention (depicted for exemplary purposes in gray scale). Depicts a middle resolution mesh model of a 3D object created according to the teachings of the present invention (depicted for exemplary purposes in gray scale). Depicts a high resolution mesh model of a 3D object created according to the teachings of the present invention (depicted for exemplary purposes in gray scale). Depicts a mesh of lower resolution than created through a down resolution process. Depicts a mesh of lower resolution than created through a down resolution process.

5. Claims 10 and 11, "wherein said reference object comprises at least one or plurality of planes each of which contain the ray", Migdal discloses (Fig. 10d) depicts an initial mesh constructed from Steiner points where the initial reference object is a plane.

6. Claims 12, 13, 14 and 15 "The method of claim 1, wherein said determining the positions of the shapes comprises determining positional aspects of sub-components of individual ones of the shapes to provide the characteristic data", "The method of claim 12, wherein the individual shapes comprise polygons and the sub-components comprise vertices that define the polygons, said determining the positions of the shapes comprising computing the positions of the vertices relative to the reference object"; "the reference object comprises a plane"; "the plane is parallel to one of the to x, y, and z axes"; Migdal discloses in (Col.3,Line 21-26), that A typical 3D

object modeling system processes the 3D point data to create a "wire-frame" model that describes the surface of the object and represents it as a set of interconnected geometric shapes (sometimes called "geometric primitives"), such as a mesh of triangles, quadrangles or more complex polygons . Discloses in (Col. 4,line 4-11), that For models of real-world objects, texture data typically comes from 2D photographic images. The laser scanning systems described above can collect texture data by taking one or more 2D photographic images of the object in an ordinary light setting as they collect laser scan data. Thus, 3D scanning systems both scan an object with a laser to collect spatial data and photograph it to collect color and other surface characteristic information. Discloses in (Fig. 10d) that an initial mesh constructed from Steiner points where the initial reference object is a plane. It is obvious (right-hand normal rule) that a plane is parallel to one of the x, y and z-axes.

7. As per claim 16, "defining a collection of polygons that approximate an object, individual polygons having a plurality of vertices", Migdal discloses in (Col. 17, 22-23), the reference which most closely approximates the original object. ", As for casting a ray toward the approximated object"; defining a reference object relative to the collection of polygons and theat contains the cast ray", Migdal discloses (Col. 5,line 15-24) the tasks of "transformation," (transforming the 3D X, Y, Z coordinates of the object model to "eye-space" coordinates for a particular view, lighting the object accordingly and projecting the image onto a "window space") and "rasterization," (the process of rendering "window-space primitives" such as points, lines and polygons for the particular view and designating detailed pixel color setting information. As for "pre-characterizing at least some vertices of at least some of the polygons to provide

characteristic data that describes the vertices position relative to the reference object; and using the characteristic data to ascertain the positions of the individual polygons relative to the reference object.", Migdal discloses (Col. 25, line 57-63) the data element NEIGHBORS consists of an array of three pointers, each pointing to a FACE record for a neighboring (adjacent) face in the mesh. The data element VERTICES is an index array that references a location on the 6D data point list 142 (and the 6D (X, Y, Z, R, G, B), point information) for each of the triangles' vertices.

8. As per claim 17, "wherein the collection of polygons approximate the surface of the object", Migdal discloses in (Col. 17,Line 19-23) that using the set of originally computed normal for comparison, the present invention enables the determination of significance to be based upon the topology of the original dense mesh--i.e. the reference which most closely approximates the original object .

9. Claims 18 and 19, as for "wherein the individual polygons have a similar geometry; and wherein the individual polygons comprise triangles", Migdal illustrated in (Fig. 2c) that polygons have similar geometry and comprise of triangles.

10. As per claim 20, "wherein the collection of polygons has a plurality of faces and a plurality of vertices, said faces outnumbering said vertices", Migdal discloses in (Col. 10, line 28-41) that The edges of the newly created triangles and the neighboring triangles related to those edges are also ordered in relation to the counterclockwise or other ordering of the vertices of each face. The order of vertices and neighbors for example allows the system to perform

optimality checks in a systematic way, moving in a single direction following the ordering of the points, such as proceeding counterclockwise around the insertion point. The regularized indexing of the vertices enables the checking procedure to easily orient itself within the mesh and quickly maneuver to check for optimized quality. The rigid ordering of triangle vertices and neighbors also provides other speed advantages in processing mesh data.

11. Claim 21 and 22, as for "wherein at least two of said polygons share at least one side; at least two of said polygons share is at least one vertex", Migdal illustrated clearly in (Figs. 16,17,18, and 20-21) that two of polygons share on side, and one vertex.

12. Claim 23 rejected under 35 U.S.C. 112, second paragraph, as for " The method of claim 16, wherein none of said polygons share a vertex". Evidence that claim 23 fails to correspond in scope of applicant in Paper (page 10, line 19) filed on 11/29/1999. In that paper, applicant has stated "other collections can be defined where none of the triangles share a vertex", the applicant has failed to illustrate or define how the above statement is applicable.

13. As per claim 24, "wherein said using of the characteristic data comprises determining whether an individual polygon is in a sub-set of polygons that might be intersected by the ray", Migdal discloses in (Col.1, line 51-65) that in addition to creating meshes to model 3D objects, the present invention can also be used to create mesh constructions which represent 2D images (Photographs, film frames, video images and other images) which have been digitized to bit map or other formats. For 2D mesh constructions, the present invention combines the 2D spatial coordinate locations of the data (such as the x, y locations of the bitmap pixel coordinates with

the associated color values, such as the R, G, B color assignments) to create a set of combined 5D (x, y, R, G, B) "tricture" data points. The present invention uses the 5D data point values to build a "trixel map" mesh which models the 2D image through its geometric mesh construction. Like the 3D object model described above, the 2D image models of the present invention have "dynamic resolution" capabilities.

14. Claims 25 and 26, it is obvious, because the concept of mesh analysis using the characteristic data to determine whether an individual polygon in a sub-set of polygon which straddle the reference object. These claims are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. 16.

15. Claims 27-36 are rejected by Migdal for the reasons given for claims 16-26.

16. As per claim 37, "defining a sub-set of polygons from a collection of polygons that approximate an object by determining which polygons have vertices that satisfy a predefined relationship relative to a reference object; and evaluating the sub-set of polygons to ascertain which of the polygons is intersected by a cast ray", Migdal discloses in (Col. 17,Line 19-25) Using the set of originally computed normal for comparison, the present invention enables the determination of significance to be based upon the topology of the original dense mesh--i.e. The

reference, which most closely approximates the original object. In the exemplary embodiment this procedure is described in detail below.

17. Claims 37- 40 are rejected by Migdal for the reasons given for the claims 10-11.

18. Claims 41-42 recite the limitation "computer graphic processing" in 37. There is insufficient antecedent basis for this limitation in the claim.

19. Claim 43 is rejected by Migdal for the reasons given for the claim 37.

20. Claim 44 is rejected by Migdal for the reasons given for the claim 28.

21. Claim 45 is rejected by Migdal for the reasons given for the claim 29.

22. Claim 46 is rejected by Migdal for the reasons given for the claim 30.

23. Claim 47 is rejected by Migdal for the reasons given for the claim 15.

24. Claim 48 and 56 are rejected by Migdal for the reasons given for the claims 16 and 37.

25. Claim 49 is rejected by Migdal for the reasons given for the claims 7, 8 and 9.

26. As per claim 50, "A computer graphic processing system comprising: a processor; memory; and software code stored in the memory that causes the processor to implement a ray-intersection algorithm which: casts a ray at a collection of shapes that approximate an object; defines a reference object that contains the ray; pre-characterizes aspects of individual ones of the shapes of the collection to provide characteristic data; and uses the characteristic data to scertain the position of the shapes of the collection of shapes relative to the reference object.", Migdal discloses in (Fig. 1) that depicts a plurality of data points 2a (which can be a "cloud of points" or a mesh with some connectivity information) and a texture map file 2b, which the computer system 3 of the present invention uses to build a series of meshes (e.g., meshes 2c-2g). The plurality of data points 2a are spatial X, Y, Z 3D coordinates that describe the physical contours of the object. The texture map file 2b is a set of one or more bitmaps or 2D arrangements of pixel elements, which represent digitized 2D "snapshots" of the object. The X, Y, Z Coordinates in the plurality of data points link to a specific coordinate in the texture map file through a reference to a texture space u, v position. In some cases, the plurality of data points 2a will also have connectivity or other additional data associated with it such as normal data as described below.

27. As per claim 51 is rejected by Migdal for the reasons given for the claims 18 and 19.

28. Claim 52 is rejected by Migdal for the reasons given for the claim 26.

29. Claim 53 is rejected by Migdal for the reasons given for the claim 28.

30. Claim 54-55 is rejected by Migdal for the reasons given for the claims 13-14.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Javid A Amini whose telephone number is 703-608-4248. The examiner can normally be reached on 8-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Razavi can be reached on 703-305-4713. The fax phone numbers for the organization where this application or proceeding is assigned are 703-746-8705 for regular communications and 703-746-8705 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

Javid Amini
July 10, 2002

MICHAEL RAZAVI
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